

Wireless Image Transmission Using Deep Source Channel Coding With Attention Modules

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Abstract

Recent research on joint source channel coding (JSCC) for wireless communications has achieved great success owing to the employment of deep learning (DL). However, the existing work on DL based JSCC usually trains the designed network to operate under a specific signal-to-noise ratio (SNR) regime, without taking into account that the SNR level during the deployment stage may differ from that during the training stage. A number of networks are required to cover the scenario with a broad range of SNRs, which is computational inefficiency (in the training stage) and requires large storage. To overcome these drawbacks our paper proposes a novel method called Attention DL based JSCC (ADJSCC) that can successfully operate with different SNR levels during transmission. This design is inspired by the resource assignment strategy in traditional JSCC, which dynamically adjusts the compression ratio in source coding and the channel coding rate according to the channel SNR. This is achieved by resorting to attention mechanisms because these are able to allocate computing resources to more critical tasks. Instead of applying the resource allocation strategy in traditional JSCC, the ADJSCC uses the channel-wise soft attention to scaling features according to SNR conditions. We compare the ADJSCC method with the state-of-the-art DL based JSCC method through extensive experiments to demonstrate its adaptability, robustness and versatility. Compared with the existing methods, the proposed method takes less storage and is more robust in the presence of channel mismatch.